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MINI REVIEW

A Review: Urinary tract infection and its treatment Naturally

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ABSTRACT

Urinary tract infections are common in occurrences in young women across the entire age spectrum, during pregnancy, and in pre and postmenopausal women. Urinary tract infection (UTI), with its diverse clinical syndromes and affected host groups, remains one of the most common but widely misunderstood and challenging infectious diseases encountered in clinical practice. Because of the chronic nature of urinary tract infections (UTIs) and the potential for antibiotic resistance, a natural approach to prevention and treatment is desirable. Clinical research suggests some of the best natural options for long-term prevention which include cranberry mannose, vitamins, probiotics and berberine. Botanicals that can be effective at the first sign of an infection and for short-term prophylaxis include berberine and uva ursi. Estriol cream and vitamins A and C have also been shown to prevent UTIs, while potassium salts can alkalinize the urine.

INTRODUCTION

Urinary tract infections (UTIs) account for 8.3 million doctor visits yearly in the United States and are the second-most common site for infection. Infections of the lower urinary tract (urethra and bladder) are common among women – affecting as many as one in five women at some time during their lifetime. Although UTIs are not as common in men, they can indicate an obstruction such as a stone or enlarged prostate; thus, they are uncommon in men under age 50 [1]. The term UTI in this article refers to infections of the lower urinary tract – the bladder and urethra. UTIs can chronically recur – 20 percent of women who have one infection will have a recurrence. Uncomplicated Urinary tract infections are common in adult women across the entire age spectrum, with mean annual incidence of 15% and 10% in those aged 15-39 and 40-79 years, respectively [2]. Urinary tract infection with its diverse clinical syndromes and affected host groups, remains one of

the most common but widely misunderstood and challenging infectious diseases encountered in clinical practice. Recurrent urinary tract infections (UTIs) present a significant problem for women and a challenge for the doctors who care for them. The diagnosis of uncomplicated UTI can be achieved best by a thorough assessment of patient symptoms with or without the addition of a urine dipstick test [3].

Treatment of recurrent urinary tract infections in female is one of the most difficult challenges for the physicians, affecting about 25% of women with a history of isolated urinary tract infection [4]. It is certainly bothersome for the patient and the sequel may not only cause morbidity but in high risk patients carries a significant risk of mortality. When bacterial virulence increases or host defence mechanisms decrease, bacterial inoculation, colonization, and infection of the urinary tract occurs. Careful diagnosis and treatment results in successful resolution of infections in most instances. Treatment of recurrent urinary tract infection requires understanding of the pathogenesis of UTI and the role of host and bacterial factors [5]. Only with insight into this process, we can improve our ability to identify patients at risk and reduce morbidity.

An ideal antimicrobial agent should be orally administrable and able to achieve high urinary and tissue levels without

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producing any nephrotoxicity. Developments in pharmacology have lead to introduction of drugs which have significantly reduced the need for hospitalization for severe infection. Shorter-course therapy and prophylactic antimicrobial agents have reduced the morbidity and cost associated with recurrent UTI in women.

What causes UTI? [6-8]

The most common causes of UTIs (about 80%) are *Escherichia coli*, bacterial strain that usually inhabit the colon. However, many other bacteria can also cause an infection for example, *Klebsiella*, *Pseudomonas*, *Enterobacter*, *Proteus*, *Staphylococcus*, *Mycoplasma*, *Chlamydia*, *Serratia* and *Neisseria spp* but are far less frequent causes than *E. coli*. In addition, fungi (*Candida* and *Cryptococcus spp*) and some parasites (*Trichomonas*, *Schistosoma*) also may cause UTIs; *Schistosoma* causes other problems, with bladder infections as only a part of its complicated infectious process.

Common causes

Bacteria usually originate from the bowel, vagina, or skin as normal flora of the host.

Gram-positive organisms

1. *Staphylococcus saprophyticus* (causative organism in 5% to 15% of UTIs).
2. *Enterococcus faecalis*

Gram-negative organisms:

1. *Escherichia coli* (causative organism in 85% of community-acquired infections)
2. *Klebsiella pneumoniae*
3. *Proteus* and *Providencia* species
4. *Pseudomonas aeruginosa*
5. *Enterobacter* and *Serratia* species

Rare causes

1. *Salmonella* species
2. *Mycobacterium tuberculosis*
3. *Chlamydia trachomatis*
4. *Candida* species (more common in immunocompromised patients, patients with diabetes, and patients who have recently received antibiotics)
5. Multiple microbial organisms causing infection may be found in patients with renal calculi, chronic renal abscesses, indwelling urinary catheters, or a fistula between the bladder and either the bowel or the vagina

Serious causes

1. *Staphylococcus aureus* (commonly a result of bacteremia, sometimes producing renal or perinephric abscesses in addition to bacteriuria).
2. *Candida* species (found in critically ill, immunosuppressed, and chronically catheterized patients).

Symptoms of UTI [9]

- Frequent urge to urinate
- Incontinence

- Painful, burning feeling in the area of the bladder or urethra during urination
- Fatigue, lethargy
- Women feel an uncomfortable pressure above the pubic bone.
- Some men experience fullness in the rectum.
- Despite the urge to urinate, only a small amount of urine is passed
- Milky, cloudy or reddish urine
- Foul-smelling urine
- A fever, which may mean that the infection has reached the kidneys
- Pain in the back or side below the ribs
- Nausea and/or vomiting

Risk Factors [2]

Risk factors for UTI include female gender sexual activity, mode of birth control, menopause, diabetes, catheter use, and urinary tract obstruction (stone tumor, strictures, or enlarged prostate). Voiding before and after intercourse, use of cotton underwear, and avoidance of feminine hygiene deodorants and scented toilet paper may decrease risk.

Treatment

Traditionally, the treatment of UTIs consists of antimicrobial therapy administered in a regimen appropriate to the clinical situation, frequently administered temporally either as a prophylactic to reduce the risk of UTI or as a therapeutic approach. Several antibiotics such as Ciprofloxacin, fosfomycin, sulfamethoxazole, SMX-TMP, penicillins, sulfanilamide, nitrofurantoin and cephalexin have been used in therapy [10]. The customary UTI treatment involves a short course of antimicrobials such as a 3-day regimen of trimethoprim-sulfamethoxazole combination [11]. This initial therapy is based on knowledge of the predominant pathogens and their antimicrobial susceptibility [12]. Besides the therapeutic approach, preventive treatment with antibiotics is also administered to susceptible populations, including the elderly, children and women with recurrent UTIs. However, one major drawback to the use of antibiotics is the potential for development of antibiotic resistance among uropathogens [2].

The increasing prevalence of antibiotic resistant bacteria, escalating costs of antibiotic therapy and unsatisfactory therapeutic alternatives in recurrent UTIs have stimulated an interest in novel, non-antibiotic based methods for preventing and controlling UTIs [13,14].

Herbal therapy in Urinary tract infection [15,16]

Herbs are generally a safe way to strengthen and tone the body's systems. Herbal treatments for UTIs have been used for centuries (Table 2). Herbal remedies may relieve urinary tract infections by combating with the bacteria, decreasing irritation and healing urinary tract tissues. Some herbs also help prevent future occurrences. Urinary tract infection is commonly treated with prescription antibiotics. However, it is increasingly recognized that using antibiotics frequently may contribute to recurring UTIs and increased dependency on antibiotic use may

Table 1: Herbs Used in Traditional Folk Medicine for Treatment of UTIs

Herb: Latin name (common name)	Properties	Specific Indications
<i>Agrimonia eupatoria</i> (agrimony)	Astringent; diuretic	
<i>Althea officinalis</i> (marshmallow)	Mucilaginous	Soothe irritated uroepithelium
<i>Apium graveolens</i> (celery seed)	Diuretic	
<i>Arctium lappa</i> (burdock)	Antimicrobial; diuretic	<i>E. coli</i>
<i>Elymus repens</i> (couchgrass)	Antimicrobial; diuretic	Urethritis and cystitis with inflammation
<i>Hydrangea aborescens</i> (hydrangea)	Antilithic; diuretic	Cystitis with stone irritation
<i>Juniperus communis</i> (juniper)	Diuretic/aquaretic	
<i>Mentha piperita</i> (peppermint)	Antispasmodic	
<i>Taraxacum officinalis</i> (dandelion) leaf	Diuretic	
<i>Ulmus fulva</i> (slippery elm)	Mucilaginous	Soothe irritated Uroepithelium
<i>Zea mays</i> (corn silk)	Diuretic/aquaretic	

further weaken the immune system. Natural remedies can provide an effective alternative to prescription medications and their side effects.

Natural treatment & home remedy for urinary tract infection [17]

Given below are some effective home remedies for Urinary

Table 2: Botanicals for prevention and treatment of UTIs

Treatment	Intervention	Dosage	Results
<i>Vaccinium macrocarpon</i>	Cranberry juice cocktail	300ml daily for 3 months	Prevention of UTI in elderly women
	Low-sugar cranberry juice cocktail w/aspartame or placebo beverage	300 mL daily until onset of first UTI	Prevention of UTIs in elderly men and women (hx of UTI not a prerequisite)*
	Tablets	400 mg three times daily x 4 wk	No improvement in patients with neurogenic bladder
Cranberry-Lingonberry	Juice concentrate (no added sugar), <i>Lactobacillus rhamnosus</i> , or no intervention	50 mL (7.5 g cranberry/1.7 g ingonberry) daily x 6 mo; or 100 mL <i>Lactobacillus</i> drink 5 d/wk	Prevention of UTI in college-age women
Berberine sulfate	Oral administration	400 mg (one dose)	Indirect; men with enterotoxigenic <i>E. coli</i> diarrhea; stopped diarrhea which can indirectly affect migration to urinary tract
<i>Arctostaphylos uva ursi</i> w/ <i>Taraxacum officinalis</i>	UVA-E: standardized extracts of <i>uva ursi</i> leaf and dandelion herb and root;	Oral 3 tablets 3x/d for 1 mo; followed 1 yr	Prevention in women

Table 3: Vitamins and probiotics for treatment of UTIs

Treatment	Form/Route of Administration	Dosage/Length of Study	Results of Treatment: Population
Vitamin C	Oral ascorbic acid w/ or w/o ferrous sulfate & folic acid	100 mg ascorbate daily for 3 mo (w/ or w/o 200 mg ferrous sulfate & 5 mg folic acid)	Prevention of UTIs in pregnant women
Vitamin A	Antimicrobial therapy w/ oral vitamin A or placebo during infection	One 200,000 IU dose vitamin A or placebo during infection	Prevention of UTIs in children
Probiotics	Lactobacillus crispatus; vaginal suppository	Insertion every other night for 1 yr	Prevention of UTI (mean age 57.2)
	L. rhamnosus and L. fermentum or placebo; vaginal suppository	Insertion twice weekly for 2 wk; then once at the end of each of the next 2 mo	Prevention of UTIs
	L. rhamnosus and L. fermentum or Lactobacillus growth factor; vaginal suppository	Insertion once weekly for 12 mo	Prevention of UTIs (mean age 34)

Tract Infection. These are natural treatments for the disease that work.

Baking soda is a very effective remedy for UTI because of its property to neutralize the acidity in the urine.

- Baking soda is a very effective remedy for UTI because of its property to neutralize the acidity in the urine.
- Blue berry juice has been found to be one of the effective remedies for urinary tract infection. It has the property to restrict and prevent growth of bacteria that causes UTI.
- Pineapples contain an enzyme called Bromelain. Eating a cupful of pineapple in regular doses can help cure the urinary tract infection.
- Hydrotherapy or drinking plenty of water helps cure urinary tract infection naturally. Drinking eight ounces of water daily is suggested. Hot water fomentation on the lower abdomen also helps reduce the pain caused by the infection.
- Another very effective fighter against UTI is Vitamin C. Vitamin C helps in keeping the bladder healthy by acidifying urine thus preventing bacteria. Vitamin c is easily available from natural sources like bananas, guavas, kiwifruits, melons, pineapples, raspberries, tomatoes, papaya, watermelons etc.
- Cranberry juice is another very effective natural medicine which does not allow the bacteria to stick to the cells that line the tract of the urinary passage. Cranberry juice can be taken directly or mixed with apple juice to enhance the taste.
- Aromatherapy is another effective remedy for urinary tract

infection. Oils namely, the sandalwood oil, tea tree oil, bergamot oil, frankincense and juniper oil are all mixed together is rubbed on the area near the bladder. This should be continued for three or four days until the symptoms sober.

- Fresh berry juice is another effective natural remedy for urinary tract infection. People especially women who consume fresh berry juice as part of their regular diet are said to develop immunization against UTI.
- As is said that prevention is better than cure so some of the foods that causes irritation in the urinary tract should be avoided. Spicy food, alcohol, caffeine, cigarette are very harmful. Carbonated fizzy drinks like beer, soda etc. should be abstained by a patient suffering from UTI. Refined flour products like bakery readymade foods together with processed fat and sugar should be avoided.
- Artificial sugar containing Aspartame should be avoided by the patients suffering from UTI. This sort of sugar is mainly consumed by the diabetics.
- Juices are excellent sources of antioxidants and they have the capacity to kill the alien bacteria in our body. Lemon juice, tender juice of coconut, carrot juice, juice of sugarcane are some of the juices if consumed on a regular basis can prevent and control UTI. A cupful of radish juice can also work wonders.
- Shilajit, punarnava, are ideal supplements if taken can cause healing of the urinary tract infection. Chandana is again an effective remedy for urinary tract infection.

- Juice of the banana stem is also a very good remedy for urinary tract infection.

Alternative treatment options

UTIs have been a common illness in humans long before bacteria were recognized as the causative agents. Initial therapy for UTIs was primarily the use of herbal treatments to ameliorate urinary symptoms, as recorded in the Ebers papyrus from ancient Egypt [18]. The early 19th century provided detailed descriptions of UTIs with treatment that included hospitalization, bed rest, attention to diet, plastics, narcotics, herbal enemas, douches and surgery for stones, abscess and retention [18]. However, with the advent of modern medicine, the use of select antibacterial agents and antibiotics for the treatment of UTIs was put into practice. Although the effectiveness of antibiotics was validated in clinical practice, the continued use of select agents in the prophylaxis and therapy of UTIs led to the emergence of antibiotic resistant uropathogens [19]. This triggered an interest in the application of alternative, non-antibiotic approaches for preventing and controlling UTIs. This chapter discusses the various alternative approaches that are currently available and are being evaluated to control UTIs. These include the use of plant derived antimicrobials, probiotics, and vaccines targeting specific proteins in uropathogens.

Plant derived antimicrobials

Historically, plants have served as a basis for development of novel drugs, thereby contributing to human health and well-being. A variety of plant-derived polyphenols serve as dietary constituents as well as active components in a number of herbal and traditional medicines [20] (Table 2). In excess of 5000 plant polyphenols have been identified, and several of them exhibit a wide spectrum of biological effects, including antiinflammatory, antimicrobial, and anti-carcinogenic properties [21]. Several of them have been also used in the treatment and control of UTIs. These include cranberry, blueberry, berberine, bearberry, cinnamon and other herbs. Since several plant antimicrobials contain different functional groups in their structure, their antimicrobial activity is attributed to multiple mechanisms [22]. Therefore, unlike antibiotics, the potential for bacteria to develop resistance to plant antimicrobials is relatively smaller [23].

Conclusion

Infections of the genitourinary tract are common occurrences in individuals especially in young women, during pregnancy and in post menopausal women. The conventional use of antibiotics in the prevention and treatment of acute and chronic recurring infections contribute to gut and vaginal dysbiosis and bacterial antibiotic resistance. In an attempt to control the increasing trends in infections with antibiotic resistant uropathogens, there is a renewed interest in the use of non-antibiotic based intervention strategies against UTIs. Several studies have investigated the use of natural substances in the prevention and treatment of UTIs. Nutrients and botanicals such as cranberry,

berberine, cinnamaldehyde, probiotics and vaccines have demonstrated the greatest effectiveness. While most clinical research has evaluated the antimicrobial potential of these natural substances, their mechanism of action and the clinical experience of health care practitioners are critical for evaluating their effectiveness [2]. Use of these alternatives in the control of UTIs would help to circumvent dysbiosis and microbial drug resistance induced by the repeated use of antibiotics.

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